



NATIONAL ROUND TABLE ON THE ENVIRONMENT AND THE ECONOMY
TABLE RONDE NATIONALE SUR L'ENVIRONNEMENT ET L'ÉCONOMIE

NRTEE Official Reports Copyright and Reproduction Notice

All **NRTEE Official Reports** (“Works”), provided on this USB memory key and identified in the **NRTEE Official Reports List** folder, contain their individual copyright and reproduction notice. The notice in each of these Works is replaced and superseded by the following copyright and reproduction notice, effective February 22, 2013:

© This Work is protected by copyright and made available for personal or public non-commercial use and may be reproduced, in part or in whole, and by any means, and may be further distributed for non-commercial use, without charge or further permission. All users are required to indicate that the reproduction, whether in part or in whole, is a copy of a Work of the National Round Table on the Environment and the Economy (NRTEE). Reproduction, in whole or in part, of this Work for the purpose of commercial redistribution is strictly prohibited. Furthermore, no right to modify or alter in any manner the Work is hereby granted.

Consultant Reports Copyright and Reproduction Notice

All **Consultant Reports** (“Works”), provided on this USB memory key and identified in the **Consultant Reports List** folder, were prepared for, or commissioned by, the National Round Table on the Environment and the Economy (“NRTEE”) in support of its research efforts, and may or may not reflect the views of the NRTEE. Such Works may not contain a copyright notice as they were not intended for public release when they were so prepared or commissioned. In the absence of a copyright notice, and where a copyright notice may in fact appear, the following notice shall be read together with the Work and, where applicable, replace and supersede any existing copyright notice, effective February 22, 2013:

© This Work is protected by copyright and made available for personal or public non-commercial use and may be reproduced, in part or in whole, and by any means, and may be further distributed for non-commercial use, without charge or further permission. All users are required to indicate that the reproduction, in part or in whole, is a copy of a Work of the National Round Table on the Environment and the Economy (NRTEE). Reproduction, in whole or in part, of this Work for the purpose of commercial redistribution is strictly prohibited. Furthermore, no right to modify or alter in any manner the Work is hereby granted.

NRT-1993016
Ted Schrecker
Sustainable Development

(Revised)

COMMONPLACES AND HERESIES
ABOUT THE HUMAN-ECOSYSTEM INTERFACE

Prepared for
National Round Table on the Environment and the Economy
Colloquium on Sustainable Development Reporting

London, Ontario
November 25-26, 1993

Ted Schrecker
P.O. Box 1409, Station A
London, Ontario N6A 5M2

(519) 474-1470

NRTEE

~~5070-11893~~

NRT-1993016 18/12

COMMONPLACES AND HERESIES ABOUT THE HUMAN-ECOSYSTEM INTERFACE

Introduction

The organizational structure of the colloquium for which this paper was originally prepared originated in research by R.A. Hodge. For purposes of organizing systems of sustainable development reporting, Hodge identified four domains of data and information.¹ This paper attempts to address the domain to which Hodge he refers as the interaction between people and the ecosystem; it is subsequently referred to for convenience as HEI, an acronym for human-ecosystem interface. According to Hodge, the basic principle for reporting information about this domain is that: "Ideally, human activities would be classified and assessed in terms of their 'value' (contribution to provision of basic needs and an enhanced quality of life) and by the physical, chemical, and biological stresses they impose on the ecosystem."²

The approach adopted here is somewhat different from that of Hodge, but the differences involve emphases and style rather than basic conceptual disagreements. I am less prepared than Hodge to treat many stresses imposed on ecosystems by human activity as *prima facie* undesirable. Economic activity is first and foremost about the provision of livelihood, whether or not it takes place within the so-call formal or money economy. Our frequent indifference to this fact is a result of chance and situation. Postwar industrial societies "are a remarkable exception to the prevailing historical pattern: the bulk of their population does *not* live under conditions of hunger and economic insecurity."³ In addition, virtually all economic activity involves some degree of stress on ecosystems, even though that stress may appear insignificant. We can tread more lightly on the earth, but we cannot make ourselves weightless. Consequently, there are almost always tradeoffs to be considered between stresses on ecosystems and the more ample or effective provision of livelihoods.

I am also more inclined toward definitions and conceptualizations of sustainability that are fundamentally economic in nature. This is partly for the reasons just outlined, but there is another as well. Economics, through the synthetic discipline of political economy, provides a

1. R.A. Hodge, "Reporting on Sustainable and Equitable Development," Project Paper no. 1, Conceptual Approach (Draft for discussion, Ottawa: Evaluation Unit, Corporate Affairs and Initiatives Division, International Development Research Centre, October 1993), 11.

2. *Ibid.*, 16.

3. R. Inglehart, "Post-Materialism in an Era of Insecurity," *American Political Science Review* 75 (1981), 881.

set of assumptions about the motivations for human activity that are admittedly flawed and incomplete. They nevertheless appear to have more analytical and predictive power than any alternative set of such assumptions, as illustrated (for example) by recent research on the political economy of transitions from authoritarian rule.⁴

Finally, I think it important to emphasize that any number of development patterns might meet a variety of plausible criteria for sustainability and nevertheless constitute bad (or at least thoroughly contestable) public policy. Sustainable development should not become a surrogate for any particular policy analyst's vision of utopia. Core criteria for sustainability must be specified with precision, and must be transparent enough to facilitate disagreement about their adequacy. Reporting systems that provide a basis for assessing compliance with those criteria must likewise be designed to facilitate informed disagreement, perhaps even to encourage it. Rather than aiming for a small number of key indicators that summarize the state of the HEI, reporting processes should leave ample room for informed disagreement, and indeed facilitate it.

Reporting on the state of the HEI should provide the information necessary for accomplishing four tasks: (a) modifying Canada's present system of national accounts, based on a constant-wealth or constant-capital criterion; (b) determining whether human activity fails to meet Sustainable Minimum Standards (SMSs) for several kinds of ecological impacts; (c) assessing the distribution of costs and benefits from human activity that has adverse ecological consequences; and (d) developing "provocative indicators" that provide the basis for imaginative predictions of the future state of our society but also reflect, as accurately as possible, people's own assessments of their quality of life. My discussion of the information needs associated with these tasks is necessarily non-technical in nature. It is concerned less with the details of sustainable development reporting system than with what users might need, or want, to get from those systems. I have also not tried to assess whether existing information-gathering and reporting systems, in Canada or elsewhere, are adequate for these purposes.

(A) Constant Wealth

The now-familiar Brundtland Commission definition of sustainable development is that which "meets the needs of the present without compromising the ability of future generations to meet

4. A. Przeworski, "Democracy as a Contingent Outcome of Conflicts," in J. Elster and R. Slagstad (eds.), *Constitutionalism and Democracy* (Cambridge: Cambridge University Press, 1987); Przeworski, *Democracy and the Market* (Cambridge: Cambridge University Press, 1991).

their own needs."⁵ The etymology of the word economics suggests the following analogy: like a household's accounts, the accounts of a national economy should provide an indication of the extent to which a nation will be capable in the future of meeting the basic needs and aspirations of its constituents. This should be the conceptual starting point for any effort to define sustainable development in a way that is relevant for public policy, and consequently for efforts to redesign or supplement systems of national accounting.

The limitations of the information about such prospects that is provided by existing systems of national accounts were powerfully demonstrated by the efforts of Robert Repetto and his colleagues to adjust the national accounts of resource-dependent economies to take into account depletion and degradation. Such adjustments in the case of the fast-growing Indonesian economy, taking into account not only the contribution of its resource industries to the nation's economic product but also the economic losses associated with "depreciation" of the forest resource, soil degradation, and depletion of oil and gas reserves, resulted in a rate of economic growth considerably less impressive than the unadjusted figure. Even more important than this change in overall magnitudes was the comparison between gross domestic investment and resource depletion. "In most years during the period [studied] ... the depletion adjustment offsets a good part of gross capital formation. In some years, net investment was negative. A fuller accounting of natural resource depletion might conclude that in many years depletion exceeded gross investment, implying that natural resources were being depleted to finance current consumption expenditures."⁶

More recently, research conducted in connection with the United Nations Statistical Division (UNSTAT) has developed similar, but conceptually and operationally more sophisticated modifications to the national accounts of Mexico and Papua New Guinea.⁷ In addition, David Pearce and Giles Atkinson undertook a comparative exercise in which they tried to assess the sustainability of 21 national economies, based on modifications of data from national accounts. They concluded that the economies of 11 countries were sustainable; those of eight others (including Indonesia) were not sustainable; and those of the final two were marginal. Canada

5. World Commission on Environment and Development, *Our Common Future* (Oxford: Oxford University Press, 1987), 8.

6. R. Repetto *et al.*, *Wasting Assets: Natural Resources in the National Income Accounts* (Washington, D.C.: World Resources Institute, 1989), 6.

7. J. van Tongeren *et al.*, "Integrated Environmental and Economic Accounting: A Case Study for Mexico," in E. Lutz (ed.), *Toward Improved Accounting for the Environment, An UNSTAT-World Bank Symposium* (Washington, D.C: World Bank, 1993), 85-107 and P. Bartelmus, E. Lutz and S. Schweinfest, "Integrated Environmental and Economic Accounting: A Case Study for Papua New Guinea," *Ibid.*, 108-129.

was not included in the comparison.⁸ The data used were highly incomplete, and sometimes almost impressionistic. For example, the connection between air and water pollution damage estimates used in these calculations and the future income-earning potential of the asset bases of the national economies being studied was not explained. Conceptually, the exercise was nevertheless highly significant because it provides an indication of how the long-term survival and growth potential of national economies might be compared, taking into account the constraints imposed by ecology-economy linkages.

The Pearce-Atkinson exercise also exemplifies the application of a weak sustainability rule, which simply states that "an economy is sustainable if it saves more than the depreciation on its man-made [*sic*] and natural capital."⁹ This may also be thought of as a criterion of non-declining wealth. The Brundtland criterion of intergenerational equity is met, but in a way that fails to challenge the generic neoclassical assumption that human-made capital can be substituted for natural capital. The significance of such an approach in the case of resource-dependent economies should be clear even to those decision-makers whose prior concern with ecological values and indicators is minimal. There are many potential objections to such a rule, and to such an assumption. Pearce and his colleagues are themselves sceptical, and have argued for a more restrictive criterion of constant *natural* capital (CNC). The value of ecosystems, they suggest, cannot be reduced to their role as suppliers of raw materials that can be extracted or harvested, sold, and turned into marketable products. Ecosystems also provide a variety of services to human beings for which there are at present no credible substitutes: "No one has yet found a way of (feasibly) recreating the ozone layer, for example. The climate-regulating functions of ocean phytoplankton, the watershed protection functions, of tropical forests, and the pollution-cleaning and nutrient-trap functions of wetlands are all services provided by natural assets and for which there are no ready substitutes."¹⁰

Peter Victor has pointed out that there are several ways of interpreting and operationalizing a strong criterion of sustainability, each of which is problematic. Trying to assess the sustainability of an economy or a set of human activities based on inventories of the stock of natural capital raises the problem of the incomparability of physical units: "If the standing stock

8. D. Pearce and G. Atkinson, "Are National Economies Sustainable? Measuring Sustainable Development," Working Paper GEC 92-11 (London: Centre for Social and Economic Research on the Global Environment (CSERGE), 1992). For theoretical elaboration see D. Pearce and G. Atkinson, "Capital theory and the measurement of sustainable development," *Ecological Economics* 8 (1993), 103-108.

9. *Ibid.*, 12; see also H. Daly and J. Cobb, Jr., *For the Common Good* (Boston: Beacon Press, 1989), 69-76.

10. D. Pearce, A. Markandya and E. Barbier, *Blueprint for a Green Economy* (London: Earthscan, 1989), 37-38; see generally 37-43, also Pearce, "Economics, Equity and Sustainable Development," *Futures*, December 1988, 598-605.

of timber increases at the same time as the deposits of natural gas decrease, how can it be determined whether the stock of natural capital has risen, fallen, or stayed the same?"¹¹ What additions to natural capital should be taken as sufficient to compensate for, say, specified reductions in biodiversity? for desertification that directly or indirectly contributes to famine? Assigning dollar values for purposes of making such comparisons tries to get around this problem, but in the process introduces many others. Some of these problems are by now familiar: markets do not exist for many of the services provided by ecosystems; negative externalities generated by production of marketed goods and services are indirectly reflected (or not reflected at all) in market prices; common property resources are effectively priced at zero; and valuation methodologies are highly sensitive to initial (explicit or implicit) distributions of wealth and entitlements.¹² Other problems are less familiar. For instance, as Victor points out: "If price or net price rises as resource quantity is declining, the value of resource stocks as an indicator of sustainability will give precisely the wrong policy signal to government," since the increase in the value of remaining stocks may more than offset their declining quantity or quality.¹³ How credible is the process of assigning monetary option values to the preservation of species when the existence of those species may not yet be known, or when their role in maintaining ecosystem functions is incompletely and imperfectly understood?

The arguments for adopting a strong rather than a weak criterion of sustainability for reporting purposes might be compelling if a modified system of national accounts were the only component of reporting on the HEI. If instead the system of national accounts is used as only one component of reporting, they become far less compelling. Indeed, a weak sustainability criterion emerges as preferable. If a weak sustainability criterion is properly applied to the modification of national accounts, the question being asked is restricted to whether and how particular human activities have a demonstrable impact on the future income-generating potential of a national economy. Although applying a weak sustainability criterion may not provide a comprehensive answer to this question, it forces some important analytical distinctions. For example, many categories of pollution which we may regard as highly undesirable, and which may stimulate significant "defensive expenditures," nevertheless do not have a significant impact on the economy's income-generating potential. In addition, concentrating on ecological impacts to which a dollar value can clearly be attached, and which are comprehensible in the conventional language of national accounting, powerfully illustrates the link among sustainability,

11. P. Victor, "Indicators of Sustainable Development: Some Lessons from Capital Theory," in P. Victor et al., *Indicators of Ecologically Sustainable Development: Delineation Studies in Economic, Ecological and Decision Theory* (Ottawa: Canadian Environmental Advisory Council, 1990), 10.

12. See E. Hyman, "The Valuation of Extramarket Costs and Benefits in Environmental Impact Assessment," *Environmental Impact Assessment Review* 2 (1981), 227-258.

13. Victor, "Indicators of Sustainable Development," 11.

economic growth and savings. Finally, this approach may strengthen the case, and the consensus, against the most egregious instances of mismanagement of natural endowments: the ones that make no sense even if all one cares about is aggregate monetary gains or losses.

It must be emphasized once again that I am not making an argument for weak definitions of sustainability *per se*, but rather for their use in one component of sustainable development reporting. An economy that does not meet even a weak criterion for sustainability is probably in for serious long-term difficulties. An economy that does meet such a criterion may nevertheless confront such difficulties, but their significance is best assessed and demonstrated in ways other than by modifying systems of national accounts.

(B) Safe (or Sustainable?) Minimum Standards

An extensive body of research links a variety of adverse health impacts in fish, birds and mammals to several anthropogenic contaminants present in the lower Great Lakes.¹⁴ Advisory bodies to the International Joint Commission (IJC) have adopted a "weight-of-evidence" approach to determining the significance of these findings for human health, whereby this body of evidence is used in conjunction with available knowledge about mechanisms of toxicity and accumulation to determine for policy purposes whether pollution-related hazards to human health should be presumed to exist.¹⁵ The Commission has accepted this approach as the basis for recommending more aggressive efforts to reduce the use, production and discharges of a number of contaminants, specifically organochlorine compounds.¹⁶

Superficially, this is an example of what has come to be called the precautionary principle. The IJC could instead have held that conclusive scientific evidence of contaminant-linked human health effects was needed as the basis for recommending changes in policy. This latter approach has been characterized by one environmental economist as one requiring "positive evidence of 'dead bodies' before acting,"¹⁷ and by another as a "cigarette company standard of proof," referring to the tobacco industry's long-standing claim "that the etiology of cigarette smoking

14. Great Lakes Science Advisory Board, *1991 Report to the International Joint Commission* (Windsor: International Joint Commission, December 1991), 15-33.

15. *Ibid.*, 33-42.

16. International Joint Commission, *Sixth Biennial Report on Great Lakes Water Quality* (Windsor: IJC, 1992), 15-30.

17. T. Page, "A Generic View of Toxic Chemicals and Similar Risks," *Ecology Law Quarterly* 7 (1978), 237.

and lung cancer has not been 'scientifically demonstrated'.¹⁸ However, despite its appeal in specific and familiar contexts the precautionary principle is ultimately vacuous unless it is interpreted to mean taking precautions against a particular form of environmental damage or resource degradation *at any cost*.

That advice is presumably not what the IJC intended to give, and indeed in many contexts would be thoroughly irresponsible: "If a developing country has the choice between (a) investing in scrubbers on power stations to prevent acid rain and (b) building hospitals, it will build hospitals first. And it will make more sense to persuade local industry to dump its toxic waste with reasonable safety than to treat the stuff to American levels."¹⁹ The costs of such high levels of control would be prohibitive, and the effect on economies with limited resources of trying to pay them would be destructive of those economies' ability to meet basic needs. In addition, the ability of societies to make the investments needed to reduce a variety of environmental stresses, many of which have direct consequences for human health, appears to be directly correlated with increasing per capita income.²⁰

Prohibitive costs, limited resources and competing priorities are not a problem confronting only developing countries. Some references to the precautionary principle, but by no means all, incorporate explicit consideration of potentially destructive implementation or compliance costs.²¹ For this reason, a useful alternative approach may be that of trying to define safe, or sustainable, minimum standards (SMSs). "The SMS approach states quite explicitly that we should avoid irreversible environmental damage unless the social cost of doing so is unacceptably large. The rule sounds imprecise, but the SMS approach is deliberately 'fuzzy' because it does not rely on a single criterion for making discrete choices."²² The irreversibility of environmental damage need not be the only characteristic of concern. The response of some types of ecological systems to increased levels of stress is complex, non-linear, and therefore

18. T.D. Crocker, "Scientific Truths and Policy Truths in Acid Deposition Research," in T.D. Crocker (ed.), *Economic Perspectives on Acid Deposition Control*, Acid Precipitation Series vol. 8 (Boston: Butterworth, 1984), 66-67,

19. "Sharing: A Survey of the Global Environment," *The Economist*, May 30, 1992, 8.

20. World Bank, *World Development Report 1992: Development and the Environment* (New York: Oxford University Press, 1992), 10-11, 38-57, 74-75, 118-119, 170-178.

21. E.g. N. Myers, "Biodiversity and the Precautionary Principle," *Ambio* 22 (1993), 74-79.

22. D. Pearce and R. Turner, *Economics of Natural Resources and the Environment* (New York: Harvester Wheatsheaf, 1990), 317.

difficult to predict on the basis of presently available knowledge.²³ Against this background, SMSs incorporating a margin of safety may reflect a highly rational aversion to uncertainty where the probability of particular outcomes, such as the collapse of a particular fishery or the near-worst-case scenarios associated with global warming, cannot reliably be determined or calculated.²⁴ The inclusion of global warming in this category admittedly depends on how uncertain, unpredictable, and potentially catastrophic one believes its progress and impacts to be.²⁵

As suggested by my reference to safety margins, SMSs are inescapably subjective, and in many cases will be hotly contested. I view this as an advantage, since the process of arriving at such a standard means that tradeoffs and conflicting priorities are more likely to be clearly articulated. However, the nature of this process creates special demands on reporting systems: they will need to provide reliable information about the connection between specific human activities and the ecological outcomes that are of particular concern. They must also provide information about the magnitude and distribution of the costs of the feared outcome, about the rewards beneficiaries of the activities that lead to it, and about the costs of avoidance. The reference to distribution, which is expanded upon in the next section of the paper, reflects the fact that any particular set of observers may consider avoidance costs tolerable in the aggregate, but intolerable if they fall most heavily on a particular region, group or class. "Costs" in this context is a term that can and normally should be defined quite broadly.

The SMS approach has perhaps been explored most extensively in the area of conserving biodiversity, where Richard Bishop has stated that: "Adopting the SMS strategy as an objective of policy would mean avoiding extinction in day-to-day resource-management decisions. Exceptions would occur only when it is explicitly decided that costs of avoiding extinction are intolerably large or that other social objectives must take precedence."²⁶ The SMS principle is particularly appropriate here given the unpredictable nature and magnitude of the costs of

23. H. Brooks, "The typology of surprises in technology, institutions and development," in W. Clark and R. Munn (eds.), *Sustainable Development of the Biosphere* (Cambridge: Cambridge University Press, 1986), 325-348; Ludwig et al., "Uncertainty, Resource Exploitation and Conservation".

24. E. Barbier, "The global greenhouse effect: Economic impacts and policy considerations," *Natural Resources Forum*, February 1989, 20-32; D. Ludwig, R. Hilborn and C. Walters, "Uncertainty, Resource Exploitation, and Conservation: Lessons from History," *Science* 260 (1993), 17, 36; C. Perrings, "Reserved Rationality and the Precautionary Principle," in R. Costanza (ed.), *Ecological Economics* (New York: Columbia University Press, 1991), 153-167.

25. W. Nordhaus, "Economic Approaches to Greenhouse Warming" in R. Dornbusch and J. Poterba (eds.), *Global Warming: Economic Policy Responses* (Cambridge, MA: MIT Press, 1991), 33-66 and T. Schelling, "Economic Responses to Global Warming: Prospects for Cooperative Approaches," in *ibid.*, 197-221.

26. R. Bishop, "Economic Efficiency, Sustainability, and Biodiversity," *Ambio* 22 (1993), 72.

failing to conserve biodiversity, but the principle also merits application in a variety of other areas characterized by similar conditions of uncertainty or incomplete knowledge. For example, Timothy O'Riordan and Steve Rayner have identified four types of global change for which risk management strategies are required: biospheric catastrophe; climate perturbation; (further) undermining of basic needs provision; and the accumulation of micropollutants with potentially chaotic long-term consequences.²⁷ Arguably, SMSs of one sort or another are an appropriate response in each of these cases. Perhaps even more importantly given the conceptual framework of this paper, SMSs are relevant even (perhaps especially) to economies that manage to meet the weak criterion of sustainability by way of a modified system of national accounts.

For purposes of sustainable development reporting, agreement is not necessary on the precise content of an SMS. In particular, agreement is unnecessary and indeed improbable on the definition of intolerable costs. However, it is important clearly to identify the types of ecological damage against which it is thought appropriate to take the SMS approach. It is also important to provide as much detail as possible about the human activities that generate or are associated with that damage and about the nature of the causal connections, both direct and indirect. Thus identifying emissions from internal combustion engines as a major source of carbon dioxide gives only part of the picture. On the other hand, the information that urban population density per hectare in the industrialized world is strongly correlated with gasoline consumption per capita and its environmental impacts, including carbon dioxide emissions,²⁸ provides far more insight into the dynamics involved. Finally, since the SMS approach incorporates explicit reference to unacceptable costs, reporting should provide the information necessary to determine the magnitude and incidence of the costs of meeting the SMS. The question of incidence is explored in the next section of the paper.

(C) Distributional Considerations

"It is perfectly possible for a single nation to secure a sustainable development path ... *but at the cost of non-sustainability in another country.*"²⁹ At the macro-level, the example of Japanese and EEC imports of tropical hardwoods provides a useful example. On a weak view of sustainability, Pearce and his colleagues note that this need not matter, since "the hardwood

27. T. O'Riordan and S. Rayner, "Risk management for global environmental change," *Global Environmental Change* 1 (1991), 97-98, 102-103.

28. P. Newman, "Greenhouse, Oil and Cities," *Futures* (May 1991), 335-348.

29. Pearce *et al.*, *Blueprint for a Green Economy*, 45.

exporting countries may simply be converting their export revenues into investments which will sustain their future. Unfortunately we have little evidence that this is happening."³⁰

One of the merits of the approach to national accounts I have suggested is that it could provide both exporting and importing countries or regions in question with the information needed to determine whether this is the case, assuming for the sake of argument that they care. On a strong view of sustainability, one sceptical about the substitutability of natural for human-made capital, concern would be focused instead on actual forest management practices, on the potential for reforestation or ecosystem rehabilitation, and on the possibility of substitution or compensation for the services provided by the relevant forest ecosystem(s) ... in other words, on uncertainty and irreversibility. In either instance, it is clearly worth knowing whether and how particular national or regional economies are importing sustainability by exporting the various ecological costs of human activity.

William Rees's concept of ecological footprints could make a major contribution to addressing this question, if it were used as an organizing principle for information gathering and reporting systems. Urban regions and developed countries alike, according to Rees, may be "importing sustainability" not only by way of importing physical resources, and thereby exporting the environmental degradation associated with their extraction or cultivation (for example in the case of input-intensive plantation agriculture) but also by appropriating the use of ecosystem functions not directly related to resource trade.³¹ For example, it could be argued that fossil fuel consumers in rich countries rely on the carbon dioxide absorbing function provided by tropical moist forests, which they obtain at a price of zero. The terms of ecological trade must also be considered. Despite the Brundtland Commission's efforts to draw attention to this problem, we often forget how the power dynamics of international trade and investment leave developing countries as price-takers on commodity markets, often with devastating effects on their domestic economies and ecologies.

An intriguing recent proposal originating in the United States reflects the same underlying concerns as the ecological footprint concept. It would provide information about various costs and benefits of human activity by requiring major consumer product firms to prepare social-environmental impact statements detailing "the impacts of extracting, transporting, and transforming major raw materials, and of the production, testing, use and disposal of consumer products." They would provide information on environmental damage as well as on such issues as wages, working conditions, and human rights violations in the product's country or region

30. *Ibid.*

31. W. Rees, "Ecological footprints and appropriated carrying capacity: what urban economics leaves out," *Environment and Urbanization* 4 (no. 2, October 1992), 121-130.

of origin. The impact statement requirement would encompass the activities of suppliers of major inputs as well as those of the product's final manufacturer or marketer. "Who knows how many companies will uncover, in the course of preparing their SEIS, direct links to Chinese prison camps, Khmer Rouge lumber operations, exploitation of child labour, clear-cutting of the rain forest, or other insupportable activities?"³²

This form of reporting could serve the needs of various decision-makers. However, it must also be noted that the existence of low wages, deplorable working conditions and abysmal environmental quality does not automatically indicate the presence of superior alternatives for the people in question. This is the dilemma of industrialization that was stated eloquently by Barrington Moore at the conclusion of his study of Indian economic development, but which has far broader relevance: "the poor bear the heaviest costs of modernization under both socialist and capitalist auspices. The only justification for imposing the costs is that they would become steadily worse off without it." The dilemma is "indeed a cruel one," but: "To deny that it exists is, on the other hand, the acme of both intellectual and political irresponsibility."³³

Another approach to the spatial distribution of ecosystem impacts that is by now familiar involves comparing the consumption of energy and a variety of other resources in rich and poor countries. The Brundtland report points out that countries with 26 percent of the world's population account for 80 percent of the world's commercial energy consumption, 79 percent of its paper consumption, and 86 percent of its steel consumption.³⁴ These indicators are valuable to the extent that they demonstrate the potential ecological and resource consumption consequences of widespread industrialization in other parts of the globe. However, extreme caution should be used when using them as indicators of "overconsumption" in the rich countries, for at least two reasons.

First, neither the rich countries nor the poor ones are homogeneous in economic terms. Few people in the industrialized world suffer the immiseration that is routine in much of the developing world, although that may well be changing, but their situation in terms of what they are able to consume is nevertheless sufficiently bleak that few of us would wish it universalized. Conversely, the Third World is not a homogenous mass of impoverished people. "High-income households in Third World cities such as Lagos, São Paulo and Bangkok may have levels of non-renewable resource use comparable to high-income households in Los Angeles or Houston;

32. D. Sarokin, "A Proposal to Create a Social-Environmental Impact Statement for Major Items in Commerce" (Washington, D.C.: Public Data Project, 1992).

33. Moore, *Social Origins of Dictatorship and Democracy* (Boston: Beacon, 1966), 410.

34. WCED, *Our Common Future*, 33.

it is the fact that there are so much fewer of them within the city population which keeps city averages much lower."³⁵

The dramatic intra-city differences in environmental quality and the associated human health effects observable in those cities are a direct consequence of inequalities in the distribution of income and political power, and arguably are directly comparable to the differences in environmental quality and quality of life observed during the earlier stages of industrialization in what are now the industrialized countries. Indeed, intra-city differences in quality of life are becoming increasingly apparent in the industrialized countries as well, as illustrated by the return of tuberculosis as a public health threat and the Third World-style survival prospect for black men in parts of New York.³⁶ These phenomena are not directly related to ecosystem impacts; they are cited simply to make the point that aggregate indicators of any sort can mask tremendous differentials in how the impacts being measured are felt, and whom they hurt. An important component of knowledge about all such impacts is therefore "situated knowledge".³⁷ In addition, the preceding observations indicate a crucial limitation of averages and of indicators stated on a *per capita* basis, whether they refer to income, resource consumption, or anything else.

Second, the implication in much of the environmental discourse is that overconsumption of resources is somehow divorced from the provision of basic needs, which could presumably be met by activities using fewer resources and with more benign ecological impacts. This is conspicuously not the case in many poor countries, where (as the Brundtland report and countless other analyses have pointed out) people often destroy the environment precisely because there is no other way for them to meet the most basic of needs in the short term. Neither is it the case in rich countries. Most activities that are claimed to involve overconsumption of natural resources, according to whatever definition is being used at the moment, also provide employment that makes possible the meeting of basic needs. The options available to the people in question may be severely limited, and their access to livelihood contingent and transitory. Thus, a job in tourism pays about one-third as much as an average worker will earn logging the forests of Clayoquot Sound in British Columbia, and that the

35. J. Hardoy, D. Mitlin and D. Satterthwaite, *Environmental Problems in Third World Cities* (London: Earthscan, 1992), 186. On the extent of economic inequality within poor countries, see also United Nations Development Program, *Human Development Report 1992* (New York: Oxford University Press, 1992), 96-103.

36. P. Brown, "The return of the big killer," *New Scientist*, October 10, 1992, 30-37; T. Frieden *et al.*, "The Emergence of Drug-Resistant Tuberculosis in New York City," *New England Journal of Medicine* 328 (1993), 521-526; C. McCord and H. Freeman, "Excess Mortality in Harlem," *New England Journal of Medicine* 322 (1990), 173-177.

37. D. Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," *Feminist Studies* 14 (1988), 575-599.

multiplier effects associated with tourism employment are predictably less substantial.³⁸ We might not like speedboats, and might have an affective attachment to proposals to tax their production and use out of existence, but distributional consequences implied by such a decision should not be overlooked.³⁹ The connections among human activity, the provision of well-being and ecological impact are "polycentric".⁴⁰

(D) "Provocative Indicators"

The concept of a provocative indicator is drawn from a Seattle-based study of indicators of sustainable community, in which lists of indicators of sustainability under a number of general headings were originally divided into primary, secondary, and provocative. Examples of provocative indicators:

Resource consumption: the number of neighbourhoods where grocery store, general shopping and mass transit station are located within three miles; the revenues of appliance repair businesses and thrift stores (indicating a tendency to repair and re-use rather than discard).

Natural environment: ratio of pavement to planted area; acres of wetlands remaining in the particular jurisdiction in question.

Transportation: percentage of residents living within three miles of their workplaces; average total cost, including time, of driving between various locations in the city as opposed to taking a bus; acres of land allocated to people vs. cars [including not only road area but also parking lots, car dealerships, service stations, etc.].⁴¹ (I would add

38. R. Matas, "Clayoquot: The sound and the fury," *The Globe and Mail*, May 22, 1993, A6.

39. As another illustration, employment at the mines that gave the community of Asbestos, Quebec its name dropped from 2800 in 1959 to 750 by 1982. In the process, the community went from having one of the highest *per capita* incomes in Canada to economic near-collapse, with the attendant range of social pathologies. I am indebted to Sylvie Tourigny for this example.

40. "We may visualize this kind of situation by thinking of a spider web. A pull on one strand will distribute tensions after a complicated pattern throughout the web as a whole. Doubling the original pull will, in all likelihood, not simply double each of the resulting tensions but will rather create a different complicated pattern of tensions. This is a 'polycentric' situation because it is 'many centred'--each crossing of strands is a distinct centre for distributing tensions." L. Fuller, "The Forms and Limits of Adjudication," *Harvard Law Review* 92 (1978) [originally circulated in 1961], 395.

41. "Proposed Indicators, Sustainable Seattle, 1992," Appendix 5 to T. Hancock, "Reporting on Sustainable Development: The Household and Municipal Level," Report to National Round Table on the Environment and the Economy Task Force on Sustainable Development Reporting, Draft #2 (Kleinburg, Ontario, February 1993). Provocative indicators were not retained as a distinct category in the final report of this project: *The Sustainable*

average traffic density and speed in residential areas, perhaps differentiated according to the average household income of the neighbourhood.)

Devising provocative indicators is itself a worthwhile process, because the process of developing such indicators requires identifying competing conceptions of quality of life, and invites candid debate about them. One example is that being able to live far away from work is, for some people, a boon. More generally, rural lifestyles explicitly organized around avoiding the highly resource-consumptive dimensions of North American urban life would be completely unsustainable on almost any definition if several times as many people were able to try them. This phenomenon is best thought of as the *Harrowsmith* paradox. Who gets the opportunity to participate in such lifestyles, if they are widely regarded as desirable, is therefore a social and political question of some importance. Indeed, the value-laden nature of the process of choosing indicators of the state of the HEI may mean that at some level almost all indicators are provocative, whether intentionally or not.

Many provocative indicators, although not all, are intrinsically local in scale. On a larger geographic scale, one of the clearest indications that human activity is not adequate to meet basic needs and maintain or enhance quality of life is the extent to which people are willing to incur considerable costs or risks to move elsewhere. Within cities, the frequently observed correlation between income and urban air quality allows the inference that in terms of place of residence, cleaner is definitely thought of as better. Between nations, consider the fact that each year for the past several years, more than 1.2 million Mexicans have been arrested trying to cross into the United States illegally.⁴² Dealing with the legally precarious and economically marginal status of illegal immigrants, and with increasingly aggressive enforcement efforts by the Border Patrol, nevertheless was a more attractive option than staying where they were. Similar observations could be made about increasing numbers of people around the world. The United Nations Population Fund recently warned that large-scale migration will be the price of failure to provide adequate economic opportunity for the 732 million people who will be joining the labour force in developing countries over the next 20 years. This number is larger than the *total* labour force in the developing countries as of 1990, and suggests the size of the economic development challenge that ultimately confronts the world as a whole.⁴³

It is against this background that we should consider the growing literature on "environmental refugees," and on environmental and resource constraints as contributors to intra- and

Seattle 1993 Indicators of Sustainable Community (Seattle: Sustainable Seattle, 1993).

42. D. Johnston, "Border Crossings Near Old Record; U.S. to Crack Down," *The New York Times*, February 9, 1992, 1, 34.

43. United Nations Population Fund, *The State of World Population 1993* (New York: UNFPA, 1993), 9.

international conflict. As Thomas Homer-Dixon points out: "The term 'environmental refugee' is somewhat misleading ... because it implies that environmental disruption could be a clear, proximate cause of refugee flows. Usually, though, environmental disruption will be only one of many interacting physical and social variables, including agricultural and economic decline, that ultimately force people from their homelands."⁴⁴ Large-scale migrations in Africa are among the most striking contemporary examples.⁴⁵ If the analysis of the linkages among poverty and environmental degradation provided by the Brundtland Commission and others are even partially correct, other examples are almost certain to follow.

The desire to change nation or region of residence, even at the cost of considerable hardship, is an extremely powerful indicator of what people prefer as components of quality of life. Much migration involves flight from political oppression and absolute privation. Among the many lessons of the Brundtland report is that in the global context absolute (and, for that matter, relative) privation must be understood as political outcomes whether or not environmental damage is a contributing factor. If migration or desire to migrate is to be used as an indicator of quality of life, and I would strongly argue for doing so, we must confront both the illusory nature of the line between political and economic asylum and the fact that for many people, much of the time, richer (according to the most conventional of economic criteria, the opportunities for consumption provided by high or rising money incomes) appears better. The indicator is thus provocative not only because it challenges many environmentalists' traditional disdain for the notion of a link between wealth and quality of life, but also because it unavoidably directs political attention to whether "the right to choose one's place of habitation on earth" should be regarded as a human right, as one commentator has suggested.⁴⁶

Epilogue: Inside the Black Box

Hodge's suggested framework for sustainable development reporting is based on a truly prodigious research effort in which he examined literally dozens of conceptual models of the HEI.⁴⁷ Some are highly simplistic, consisting of little more than Venn diagrams with three

44. T. Homer-Dixon, "On the Threshold: Environmental Changes as Causes of Acute Conflict," *International Security* 16 (no. 2, Fall 1991), 97.

45. O. Nnoli, "Desertification, Refugees and Regional Conflict in West Africa," *Disasters* 14 (no. 2, 1990), 132-139.

46. J. Martinez-Alier, "Ecological Perception, Environmental Policy and Distributional Conflicts: Some Lessons from History," in Costanza (ed.), *Ecological Economics*, 133.

47. R.A. Hodge, "Reporting on Sustainability," Ph.D. Diss. (School of Urban Planning, Faculty of Engineering, McGill University, Montreal, in progress), Appendix II.

partially overlapping circles labelled "economy," "ecology" and "society," or something of the sort. Others are highly complex depictions of the role of resource flows in an economy: the process Robert Ayres has elegantly captured in the term "industrial metabolism".⁴⁸ A basic weakness common to most such models is that they treat the actual process of decision-making that determines the interactions between people and the ecosystem more or less as a black box. At best, reference is made to the information needs of different decision-making groups, without considering their relative ability (or inability) to do anything with even the best quality information, or the potential adverse consequences to them of doing so.

This last point is why studying the incidence of costs and benefits of policies to achieve sustainability is so important, as has been shown with respect to the conservation of biodiversity.⁴⁹ For instance, tropical forest clearance is one of the most thoroughly studied human-induced stresses on the ecosystem, even if its implications are so far incompletely understood. Yet O'Riordan and Rayner argue that tropical forest destruction is still "addressed primarily as a management issue," rather than as the outcome of a complex set of inequalities in wealth and entitlements leading to widespread landlessness, one immediate social and economic cause of much forest destruction.⁵⁰ Even this is too simplistic a view: other authors point out that forest destruction can be traced directly to economic incentives and political initiatives on the part of governments, and the motivating force behind those incentives must in turn be understood with reference to governments' strategic efforts to reward supporters, enhance their own legitimacy, and avoid serious political unrest.⁵¹

Such sets of causal linkages are often more easily understood in other jurisdictions than in our own, but the lessons learned from studying them are important. It has been pointed out that: "we find in many instances, no economic forces whatever acting in favour of sustainable development of the biosphere."⁵² It is often rational for all the actors whose decisions affect a particular HEI to "mine" forests and soils, to externalize costs, or to maximize returns from the use of common property resources. This is not necessarily the same as imputing to the

48. R. Ayres, "Industrial metabolism and global change," *International Social Science Journal* no. 121 (August 1989), 363-373.

49. M. Munasinghe, "Biodiversity Protection Policy: Environmental Valuation and Distribution Issues," *Ambio* 21 (1992), 227-236; M. Wells, "Biodiversity Conservation, Affluence and Poverty," *Ambio* 21 (1992), 237-243.

50. O'Riordan and Rayner, "Risk management for global environmental change," 93-94.

51. H. Binswanger, "Brazilian Policies that Encourage Deforestation in the Amazon," *World Development* 19 (1991), 821-829; S. Bunker, "Policy Implementation in an Authoritarian State: A Case from Brazil," *Latin American Research Review* 18 (1983), 33-58; S. Hecht and A. Cockburn, *The Fate of the Forest* (London: Penguin, 1990).

52. C. Clark, "Economic Biases Against Sustainable Development," in Costanza (ed.), *Ecological Economics*, 325.

actors in question a bias toward short-term planning, of the type often associated with the high discount rates necessarily adopted by the poor as a survival strategy. It may be quite rational as a long-term strategy for individuals or nations to liquidate resources and move on with the gains that result.⁵³ In a sense, this observation takes us back to the tension between weak and strong versions of sustainability referred to earlier in this paper. It also suggests the importance of looking at incentive structures. Who decides about them, and who benefits from them?

Would any amount or quality of additional information have led to a different set of policies with respect to the offshore Atlantic fishery? to a different combination of land uses in the forests of Clayoquot sound? to the rigorous enforcement of environmental permit requirements in the *maquiladora*? There is little reason to think so, and the issue of how sustainability is to be achieved is therefore more fundamental than implied by the routine assertion that incentive structures have to be changed. Even the most perverse incentive structures have their beneficiaries, sometimes very influential ones who have compelling reasons to resist precisely the changes that might be conducive to sustainability.⁵⁴ In addition, resistance is likely to be mobilized on the part of people whose livelihoods may be imperilled both by change and by continuation of existing patterns of human activity, yet who have few credible options without a radical change in the existing structure of endowments or rights to the use of resources. This is not a counsel of despair, but yet another argument for asking distributional questions in sustainable development reporting.

53. *Ibid.*, 324; R. Goodland and G. Ledec, "Neoclassical Economics and Principles of Sustainable Development," *Ecological Modelling* 38 (1987), 38.

54. Fierce resistance to limiting access to federally subsidized grazing lands in the western United States is a recent case in point: T. Egan, "Wingtip 'Cowboys' in Last Stand to Hold On to Low Grazing Fees," *The New York Times*, October 29, 1993, A1, A8.